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## Visual Case Discussion

## Orbital apex syndrome in COVID-19 patient, a case report

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## 1. Discussion

On Jan 30, 2020, the world health organization (WHO) informed about a new pneumonia outbreak associated with beta-coronaviruses origin as coronavirus disease-2019 (COVID-19), which was announced as a global pandemic on March 11, 2020.<sup>1</sup> This new pandemic has spread quickly across the globe. According to the latest available data (on Feb 21st, 2021), the cumulative number of confirmed infected patients is 111,824,273 cases with 2,475,190 deaths across nearly 219 countries.<sup>2</sup>

The majority of patients with COVID-19 in the current pandemic have mild symptoms with a good prognosis; so far, a few patients have progressed to critical situations.<sup>3</sup> As reported initially, the common symptoms of COVID-19 include pyrexia, cough, shortness of breath, muscle aches, sore throat, chest pain, and gastrointestinal symptoms.<sup>4</sup> Limited data is showing some ocular presentations such as viral conjunctivitis as a possible early manifestation of COVID-19.<sup>5</sup> The pandemic quickly became a disease with a thousand faces and the rare manifestations were published in clinical case reports. The reported ocular symptoms in patients with COVID-19 include dry eye, blurred vision, foreign body sensation, conjunctival congestion and secretions, eye pain, and rarely eyelid swelling related to orbital cellulitis.<sup>6–9</sup>

Orbital cellulitis is an inflammatory process involving the tissues located posterior to the orbital septum. It commonly presents with red and swollen eyelids, chemosis, periocular pain, limited and painful eye movements, proptosis, and impaired vision with afferent pupillary defect (APD).<sup>10,11</sup>

Orbital Apex syndrome is characterized by involvement of optic nerve (II), oculomotor nerve (III), trochlear nerve (IV), abducens nerve

(VI), and the first division of the trigeminal nerve (V); which induced sudden vision loss, ophthalmoplegia, and ocular pain.<sup>12</sup> The orbital apex syndrome has a variety of etiologies including trauma, infections, inflammations, malignancies, and vascular or endocrine diseases.<sup>13</sup>

However the published reports of ocular involvements in COVID-19 are currently limited, there are few reports of orbital involvement in patients with COVID-19 such as orbital cellulitis<sup>9</sup> or complete ophthalmoplegia.<sup>14</sup>

This study presents orbital cellulitis which progress to orbital apex syndrome as one of the possible manifestations of COVID-19. It is indeterminate that COVID-19 is coincidental or a predisposing factor to this presentation. Due to temporal association and the lack of the symptoms of chronic sinusitis, we hypothesized that upper respiratory congestion in the setting of COVID-19 contributed to compromised mucociliary clearance, secondary sinus obstruction, immunodeficiency due to disease, and resultant bacterial orbital super-infection led to orbital apex syndrome. Although, for confirming this hypothesis more studies and reports are warranted in the future.

## 2. Visual case discussion

A 37 years old male without underlying systemic disease presented to the emergency department with cough, shortness of breath, and low blood-oxygen levels. The initial vital signs showed mild tachycardia (heart rate=114 ppm), hypertension (Bp=150/95 mmHg), and tachypnea (respiratory rate=26 bpm). The complete blood count (CBC) test revealed leukocytosis ( $21 \times 10^3/\text{ul}$ ) with 81% neutrophils. Other laboratory work-up included fasting blood sugar (FBS): 98 mg/dl, blood urea nitrogen (BUN): 47 mg/dl, creatinine: 2.1 mg/dl, erythrocyte

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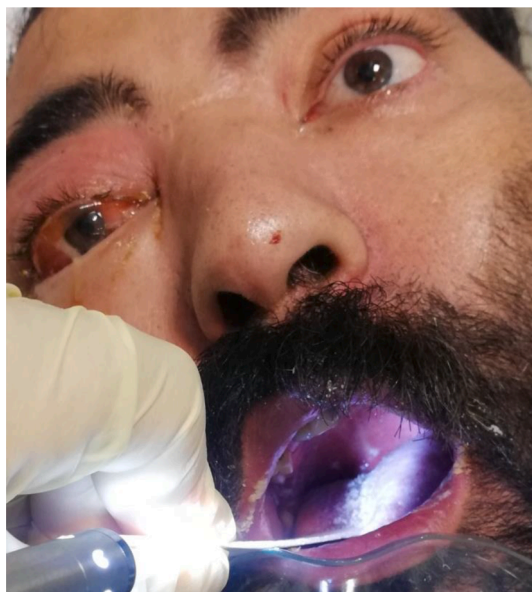
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**Fig. 1.** Clinical photographs showing right sided eyelid erythema, swelling, proptosis, ptosis, with conjunctival chemosis and discharge. Complete ophthalmoplegia (frozen eye) prominent in ophthalmic exam in the right eye.



**Fig. 2.** This figure shows no sign of necrotic lesion in examination of the palate and roof of the mouth.

sedimentation rate (ESR): 61, and C-reactive protein (CRP): 3+. The nasal swab for COVID-19 polymerase chain reaction (PCR) was positive. He was admitted and underwent remdesivir and interferon beta-1 therapy along with 2 times plasma exchange.

On hospital day 9, due to an eyelid erythema and edema with conjunctival injection, an ophthalmology consultation was requested. The patient was conscious, oriented to person, place, and time, and

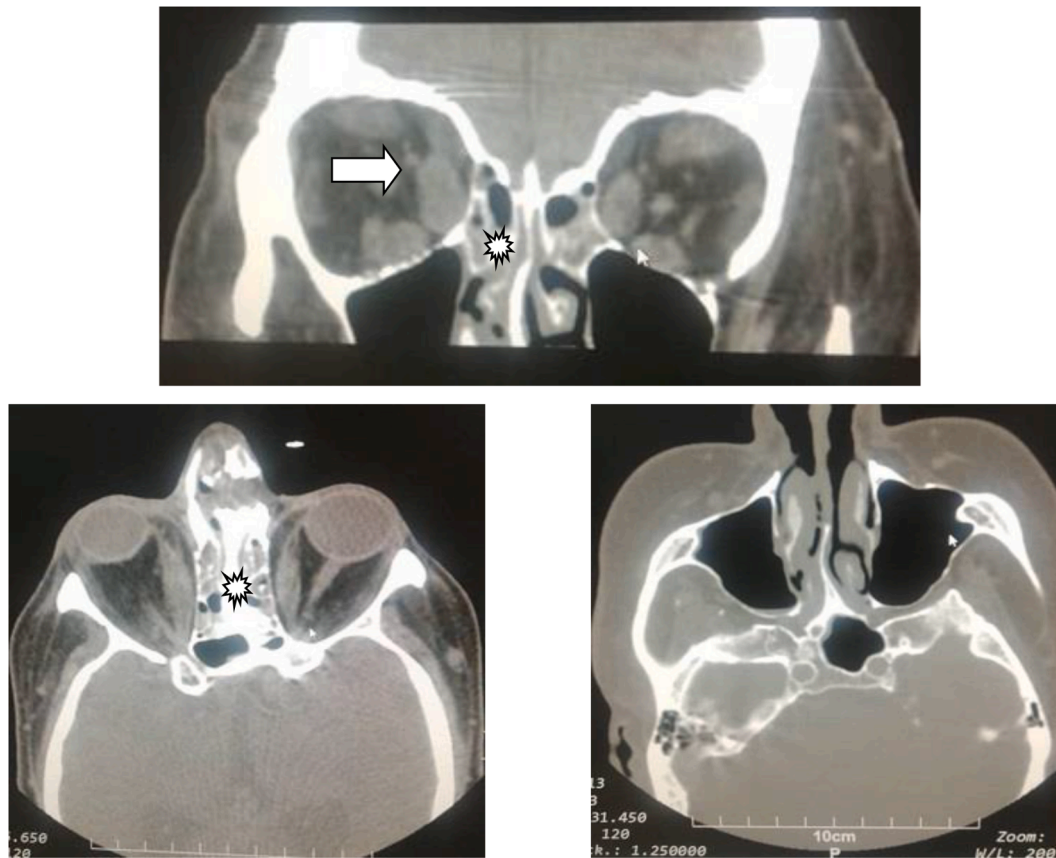
afebrile. The blood-oxygen levels were <75% with oxygen masks at flow rates of 8 lit/min. In ophthalmological examination, conjunctival injection with watery discharges, right eyelid erythema, edema and ptosis, and proptosis, were prominent. Likewise, the complete ophthalmoplegia (frozen eye) and loss of sensation on the right side of the face were remarkable (Fig. 1). His visual acuity was no light perception (NLP) in his right eye with unilaterally fixed and dilated pupil and positive APD. The oral examination didn't show any signs of necrotic or other lesions (Fig. 2). Fig. 3 shows the patient's computed tomography (CT) scan of the orbit. Based on the clinical examination and paraclinical findings, diagnosis of orbital apex syndrome was made, and antibiotic therapy including meropenem, vancomycin, and amphotericin B, prescribed. Also, urgent otolaryngology and neurosurgery counseling ruled out any signs of fungal infection including rhino-orbito-cerebral mucormycosis.

To our best knowledge, the most likely differential diagnosis in this patient was cavernous sinus thrombosis due to the orbital cellulitis, probably in the setting of COVID-19 infection. Unfortunately, the patients died on hospital Day 14 and further evaluations were discontinued.

#### Questions

- 1 What is the most common ocular presentation in COVID-19 patients?
  - A Orbital cellulitis
  - B Orbital apex syndrome
  - C Conjunctivitis
  - D Dry eye syndrome
- 2 Which cranial nerve (CN) paralysis is not a characteristic of orbital apex syndrome?
  - A CN III
  - B CN IV
  - C The first division of the CN V
  - D The second division of the CN V





**Fig. 3.** Coronal (upper) and axial (lower left and right) orbital CT scans without contrast revealed dirty orbit, proptosis, extraocular muscles involvement in right side (arrows) with ethmoidal sinus involvement (asterisk).

### Answers

- 1 C) The most common manifestation of ocular involvement in COVID-19 patients has been viral conjunctivitis so far.
- 2 D) Orbital Apex syndrome is characterized by the involvement of CN II, CN III, CN IV, CN VI, and the first division of the CN V.

### Declaration of Competing Interest

The ICJME form is filled out and attached separately.

### Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.visj.2021.101006](https://doi.org/10.1016/j.visj.2021.101006).

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